PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 385478008WO	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/US04/33383	International filing date *(day/month/year)* 08 October 2004 (08.10.2004)	Priority date *(day/month/year)* 09 October 2003 (09.10.2003)
International Patent Classification (IPC) or national classification and IPC IPC(7): G01R 33/02, 23/00, 23/16; G01F 19/00 and US Cl.: 324/248,244 702/75,76,77		
Applicant WAVBANK, INC.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 7 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:

   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 10 sheets, as follows:

   ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

   ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) ________ , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
29 August 2005 (29.08.2005)	03 November 2005 (03.11.2005)
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Lydia Deul For Kenneth J. Whittington Telephone No. (571) 272-2800

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY	International application No. PCT/US04/33383

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into English , which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1(b))

☐ publication of the international application (under Rule 12.4(a))

☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-42 as originally filed/furnished
pages* NONE received by this Authority on
pages* NONE received by this Authority on

☒ the claims:

pages NONE as originally filed/furnished
pages* NONE as amended (together with any statement) under Article 19
pages* 43-52 received by this Authority on 29 August 2005 (29.08.2005)
pages* NONE received by this Authority on

☒ the drawings:

pages 35/35 as originally filed/furnished
pages* NONE received by this Authority on
pages* NONE received by this Authority on

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages
☐ the claims, Nos
☐ the drawings, sheets/figs
☐ the sequence listing (*specify*):
☐ any table(s) related to the sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages
☐ the claims, Nos
☐ the drawings, sheets/figs
☐ the sequence listing (*specify*):
☐ any table(s) related to the sequence listing (*specify*):

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY	International application No. PCT/US04/33383

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application

☒ claims Nos. 24 and 25

because:

☒ the said international application, or the said claim Nos. 24 and 25 relate to the following subject matter which does not require an international preliminary examination *(specify)*:

These claims are not statutory subject matter uner 35 USC 101.

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. ________ are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. ________ are so inadequately supported by the description that no meaningful opinion could be formed *(specify)*:

☐ no international search report has been established for said claims Nos. ________

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

- ☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in a form and manner acceptable to it.
- ☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in a form and manner acceptable to it.
- ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13*ter*.1(a) or (b) and 13*ter*.2.

☐ a meaningful opinion could not be formed without the tables related to the sequence listings; the applicant did not, within the prescribed time limit, furnish such tables in electronic form complying with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions, and such tables were not available to the International Preliminary Examining Authority in a form and manner acceptable to it.

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in electronic form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.

☐ See Supplemental Box for further details

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-23 and 26-41	YES
	Claims	NONE	NO
Inventive Step (IS)	Claims	4-6, 10, 13-23, 40 and 41	YES
	Claims	1-3, 7-9, 11, 12, 26-39	NO
Industrial Applicability (IA)	Claims	1-23 and 26-41	YES
	Claims	24 and 25	NO

2. Citations and Explanations (Rule 70.7)
Please See Continuation Sheet

Box No. VII **Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

On page 28, paragrpah 00151, line 12, "provides" should be deleted.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

V. 2. Citations and Explanations:
Claims 1-3, 7-9, 11, 12, 26-30 and 37-39 lack an inventive step under PCT Article 33(3) as being obvious over Sager et al. in view of Nagaishi et al. and Schlosser et al. Regarding these claims Sager et al. teaches an emissions detector near a sample (See Sager et al. FIGS. 1-3, items 16 and 17), a SQUID device (See item 15), a noise canceling component (See col. 3, lines 22-30 and col. 4, lines 10-21, note that the cross correlation removes noise from signal in SQUID), a noise generator to provide noise in the range from DC to 100+MHZ to the sample (See FIGS. 1-3 items 11 and 12 and col. 1, lines 53-66), an emitter of the noise comprising a second order gradiometer having a general Helmholtz arrangement (See FIGS. 1-3, item 42), a controller for controlling the apparatus (See FIG. 4 and col. 4, line 62 to col. 5, line 39), an output port for providing a signal (See FIG. 4, items 67 and 68), a signal analyzer for receiving the signal from the output (See FIG. 4, item 66) the analyzer performing a Fourier transform of the spectra in the frequencies over time periods in the range received from the sample (See col. 5, line 60 to col. 6, line 14) having a portion operating as a user interface (See FIG. 4, item 66). Nagaishi et al. teaches of a electromagnetic shield comprising permalloy that shields the cryogenic dewar, the sample, the sensors/emitter and other components (See Nagaishi et al. FIG. 3, item 4). Nagaishi et al. also teaches an attenuation tube for receiving the source therein, providing shielding and positions the sample in the apparatus (See FIG. 3, item 2). It would have been obvious to employ the shielding to protect the electronics from outside influences and to use the attenuation tube to move the sample inside the apparatus for examination by the electronics inside the dewar. Schlosser et al. teaches repeating exposure to noise sufficient times to allow for averaging in respective frequency bins following Fourier transform to achieve optimal waveform characteristics (See Schlosser col. 1, line 52 to col. 2, line 31). It would have been obvious to average the spectra over several samples and place them in to respective frequency bins in order to excise Harmonics from the signal (Note same paragraphs).

Claims 31-36 lack an inventive step under PCT Article 33(3) as being obvious over the prior art as applied above and further in view of Noble et al. The noted combination teaches the method outlined in the claim. However, while the combination teaches of using appropriate circuitry for carrying out the invention, it does not disclose the method being implemented by a computer-readable medium. It is well known to incorporate and control apparatus via a computer-readable medium as, for example, taught by Noble et al. which teaches such a computer-readable medium, such as a disk, read-only-memory, random-access-memory, hard disks, floppy disks, non-volatile memories, and other storage configurations (See Noble et al. col. 3, lines 49-67 and claim 13). It would have been obvious to incorporate such a medium in the apparatus of the noted combination in order because such devices are art recognized

Supplemental Box

equivalents to carry out a process. Furthermore, the apparatus of the noted combination necessarily has some sort of memory to carry out the functions of the apparatus, such as frequency manipulation, Fourier analysis, storage in the frequency bins, and displaying the results in the analyzer.

Claims 4-6 and 13-23 meet the criteria set out in PCT Article 33(2)-(3), because while the prior art discloses various emdodiments for carrying out a Fourier transform, averaging or adding the spectra in certain bins and display of the results, the prior art does not teach or fairly suggest the placement of a count in lieu of the spectra amplitude in each frequency bin and generating a display showing each bin over a frequency range.

Claims 10, 40 and 41 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the noise canceling means by either an inverter or a noise canceling component, having the structure or canceling in the manner as outlined in these claims.

Claims 1-23 and 26-41 meet the criteria set out in PCT Article 33(4), and thus meet industrial applicability because the subject matter claimed can be made or used in industry.

------------------- NEW CITATIONS -------------------

AMENDMENTS TO THE CLAIMS

Following is a complete list of the claims, as amended:

(Amended) 1. Apparatus for interrogating a sample that exhibits low-frequency molecular motion, comprising:

a container adapted for receiving the sample, the container having both magnetic and electromagnetic shielding;

an adjustable-power source of white or Gaussian noise for directing white or Gaussian noise to the sample, with the sample in the container;

a detector for detecting an electromagnetic time-domain signal composed of sample source radiation superimposed with the directed white or Gaussian noise; ~~and~~

an electronic computer adapted to receive the time-domain signal from the detector, and to process the signal to generate a spectral plot that displays, at a selected power setting of the white or Gaussian noise source, low-frequency spectral components characteristic of the sample in a selected frequency range between DC and 50 kHz, wherein the noise power source adjustment, the sample exposure to the noise and the corresponding sample radiation detection are repeated until approximately optimal peak heights or waveform characteristics are observed in the sample radiation; and

sampling in Schlosser

a user interface to assist in identifying components in the sample, or characterizing the sample, based on the spectral plot of the signal from the electronic computer.

display

Spec 164 item 66 et Sager et al.

(Original) 2. The apparatus of claim 1, wherein the electronic computer includes a signal analyzer that functions to (i) calculate a series of Fourier spectra of the time-domain signal over each of a plurality of defined time periods, in a selected frequency range between 100 Hz and 50 kHz, and (ii) average the Fourier spectra.

(Original) 3. The apparatus of claim 2, wherein the calculating includes calculating at least five Fourier spectra, each taken over a 1-5 second time-domain interval.

(Original) 4. The apparatus of claim 1, wherein the electronic computer includes machine readable code operable to:

(i) store the time-domain signal of the sample over a sample-duration time T;

(ii) select a sampling rate F for sampling the time domain signal, where F* T is a total sample count S, F is approximately twice a frequency domain resolution f of a Real Fast Fourier Transform of the time-domain signal sampled at sampling rate F, and S>f * n, where n is at least 10,

(iii) select S/n samples from the stored time domain signal and perform a Real Fast Fourier Transform (RFFT) on the selected samples to produce an RFFT signal,

(iv) normalize the RFFT signal and calculate an average power for the RFFT signal,

(v) place an event count in each of f selected-frequency event bins where a measured power at a corresponding selected frequency is greater than an average power times a value ε, where 0< ε<1 and is chosen such that a total number of counts placed in an event bin is between about 20-50% of a maximum possible bin counts in that bin,

(vi) repeat steps (iii-v), and

(viii) generate a histogram that shows, for each event bin f over a selected frequency range, a number of event counts in each bin.

(Original) 5. The apparatus of claim 4, wherein the machine readable code is further operable to, in (iv), place the normalized power value from the RFFT signal in f corresponding-frequency power bins, and in (viii), (a) divide accumulated values placed in each of the f power bins by n, to yield an average power in each bin, and (b) display in the histogram, the average power in each bin.

AMENDED SHEET

(Original) 6. The apparatus of claim 4, wherein the machine readable code is further operable to, in (viii), identify those bins in the histogram that have an event count above a given threshold and an average power.

(Amended) 7. The apparatus of claim 1, wherein the source of white or Gaussian noise includes an adjustable-power white or Gaussian noise generator and a Helmholz coil which is contained within the magnetic electromagnetic shielding, and which receives a selected noise output signal from the noise generator in a range 100 mV to 1 V.

(Amended) 8. The apparatus of claim 7, wherein the generator is designed to inject white or Gaussian noise into the sample at a frequency between DC and 2 kHz.

(Original) 9. The apparatus of claim 1, wherein the detector is a second-derivative gradiometer which outputs a current signal, and a SQUID operatively connected to the gradiometer to convert the current signal to an amplified voltage signal.

(Amended) 10. The apparatus of claim 9, wherein the container is an attenuation tube having a sample-holding region, a magnetic shielding cage surrounding the region, and a Faraday cage also surrounding the region, wherein the source of white or Gaussian noise includes a white or Gaussian noise generator and a Helmholz coil, wherein the Helmholtz coil is contained within the magnetic cage and the Faraday cage and receives a noise output signal from the noise generator, and wherein the apparatus further includes, for use in removing stationary noise components, a signal inverter operatively connected to the noise generator and to the SQUID, for receiving white or Gaussian noise from the noise generator and outputting into the SQUID, white or Gaussian noise in inverted form with respect to the white or Gaussian noise injected to the sample.

(Amended) 11. A method for interrogating a sample that exhibits low-frequency molecular motion, comprising:

placing the sample in a container having both magnetic and electromagnetic shielding,

(a) injecting white or Gaussian noise into the sample at a selected noise amplitude;

(b) recording an electromagnetic time-domain signal composed of sample source radiation superimposed on the injected white or Gaussian noise,

(c) generating a spectral plot that contains, at a selected power setting of the white or Gaussian noise source, low-frequency, sample-dependent spectral components characteristic of the sample in a selected frequency range between 100 and 50 kHz, ~~and~~

(d) repeating (a)-(c) at different selected noise amplitudes until a plot showing a maximum or near maximum number of spectral components characteristic of the sample is generated~~.~~, and

(e) based on the plot showing the maximum or near maximum number of spectral components, characterizing the sample, or identifying components in the sample based on a comparison with one or more stored plots.

(Original) 12. The method of claim 11, wherein the generating includes (i) calculating a series of Fourier spectra of the time-domain signal over each of a plurality of defined time periods, in a selected frequency range between 100 Hz and 50 kHz, and (ii) averaging the Fourier spectra.

(Original) 13. The method of claim 12, wherein the calculating includes:

(i) storing a time-domain signal of the sample over a sample-duration time T;

(ii) selecting a sampling rate F for sampling the time-domain signal, where F* T is a total sample count S, F is approximately twice a frequency domain resolution f of a Real Fast Fourier Transform of the time-

domain signal sampled at the sampling rate F, and S>f * n, where n is at least 10,

(iii) selecting S/n samples from the stored time-domain signal and performing a Real Fast Fourier Transform (RFFT) on the selected samples to produce an RFFT signal,

(iv) normalizing the RFFT signal and calculating an average power for the RFFT signal,

(v) placing an event count in each of f selected-frequency event bins where a measured power at a corresponding selected frequency > average power * ε, where 0< ε<1 and is chosen such that a total number of counts placed in an event bin is between about 20-50% of a maximum possible bin count in that bin,

(vi) repeating (iii) through (v), and

(viii) generating a histogram that shows, for each event bin f over a selected frequency range, a number of event counts in each bin.

(Original) 14. The method of claim 13, which further includes, in (iv) placing the normalized power value from the RFFT signal in f corresponding-frequency power bins, and in (viii): (a) dividing accumulated values placed in each of the f power bins by n, to yield an average power in each bin, and (b) displaying on the histogram, the average power in each bin.

(Original) 15. The method of claim 14, which further includes identifying those bins in the histogram that have an event count above a given threshold and an average power.

(Original) 16. A method of characterizing spectral emission features of a sample material, over a selected frequency range R, comprising:

selecting S/n samples from a time-domain signal and performing a Fast Fourier Transform (FFT) on the samples to produce an FFT signal, wherein F is a sampling rate for sampling the time-domain signal, where F* T is a total sample count S, F is greater than a frequency domain resolution f of the FFT of the time-domain signal sampled at the sampling rate F, and S>f * n, where n is at least 5;

calculating an average power for the FFT signal,

placing an event count in each of f selected-frequency event bins where the measured power at the corresponding selected frequency > average power * ε, where 0< ε<1 and is chosen such that the total number of counts placed in an event bin is between about 20-50% of maximum possible bin counts in that bin; and

generating a display that shows, for each event bin f over a selected frequency range, a number of event counts in each bin.

(Original) 17. The method of claim 16, which further includes normalizing the FFT signal before calculating the average power, placing the normalized power value from the FFT in f corresponding-frequency power bins, dividing accumulated values placed in each of the f power bins by n to yield an average power in each bin, and displaying on a histogram the average power in each bin.

(Original) 18. The method of claim 17, which further includes identifying those bins in the histogram that have an event count above a given threshold and an average power.

(Original) 19. The method of claim 18, wherein R, expressed in Hz, is approximately equal to f, and the sample rate F, expressed in samples/second, is approximately 2f.

(Original) 20. The method of claim 19, wherein the method detects low-frequency emission events related to molecular emissions in a sample, and wherein R includes at least the frequency range of 100 Hz to 5 kHz.

(Original) 21. The method of claim 16, further comprising normalizing the FFT signal before calculating the average power, and wherein the FFT is a Real Fast Fourier Transform.

(Original) 22. The method of claim 16, further comprising before, selecting, storing a time-domain signal of the sample over a sample-duration time T;

(Original) 23. The method of claim 16, further comprising repeating the selecting, calculating and placing, before generating the display.

(Original) 24. A low-frequency spectral signature associated with a material of interest comprising:

a list of frequency components in the DC-50 kHz frequency range that are generated by the method of claim 16.

(Original) 25. The spectral signature of claim 24, wherein the frequencies in the list are identified from a histogram of a number of sample-dependent stochastic events occurring at each of a plurality of spectral increments within a selected frequency range between DC and 50 kHz.

(Amended) 26. An apparatus for detecting molecular signals from a sample, wherein the sample acts as a signal source, the apparatus comprising:

means for detecting electromagnetic emissions positioned near to the sample;

a Super Conducting Quantum Interference Device electrically connected to the means for detecting, wherein the Super Conducting Quantum Interference Device is positioned within a means for cryogenically cooling;

noise generation means for surrounding the signal source and the means for detecting signals with structured or uniform noise;

means for electromagnetically shielding the signal source, means for detecting, and Super Conducting Quantum Interference Device from external electromagnetic radiation, and wherein the means for electromagnetically shielding is positioned exterior to the means for cryogenically cooling;

means for controlling the Super Conducting Quantum Interference Device; ~~and~~

means for observing the signal detected by the means for detecting electromagnetic emissions~~.~~;

means for repeating noise generation and signal detection until approximately optimal peak heights or waveform characteristics are observed in the detected signal; and

means for interfacing with the apparatus to characterize the sample based on the approximately optimal peak heights or waveform characteristics observed in the detected signal, or identifying components in the sample by comparing the approximately optimal peak heights or waveform characteristics observed in the detected signal to stored signals.

(Original) 27. The apparatus of claim 26, further comprising tube means for vertically receiving the signal source therein, wherein the tube means provides at least 2 kHz of low pass filtering.

(Original) 28. The apparatus of claim 26, further comprising automatic loading means for automatically and vertically positioning the signal source within the apparatus.

(Original) 29. The apparatus of claim 26, further comprising superconducting lead shielding that at least partially encloses the signal source and means for detecting.

(Original) 30. The apparatus of claim 26 wherein the means for detecting includes a second derivative gradiometer.

(Original) 31. A computer-readable medium whose contents cause at least one data processing device to perform a method to display data representing electromagnetic emissions from a sample, the method comprising:

receiving a sample signal that has been produced by applying noise to a sample within a magnetically shielded detection apparatus, wherein a combination of the noise with an electromagnetic signal emitted by the sample takes on a different characteristic than the noise through stochastic resonance, and wherein the magnetically shielded detection apparatus includes therein a Super Conducting Quantum Interference Device electrically connected to at least one electromagnetic emission detection coil;

applying a Fast Fourier Transform to the sample signal; and

displaying, via a graphical user interface, the sample signal, wherein the sample signal is displayed as a series of peaks at select frequencies, wherein the peaks are substantially greater than other peaks in the sample signal, and wherein at least some of the other peaks represent the noise.

(Original) 32. The computer-readable medium of claim 31 wherein the computer-readable medium is a memory of the data processing device.

(Original) 33. The computer-readable medium of claim 31 wherein the computer-readable medium is a logical node in a computer network receiving the contents.

(Original) 34. The computer-readable medium of claim 31 wherein the computer-readable medium is a computer-readable disk.

(Original) 35. The computer-readable medium of claim 31 wherein the computer-readable medium is a data transmission medium carrying a generated data signal containing the contents.

(Original) 36. The computer-readable medium of claim 31 wherein the computer-readable medium is a memory of a computer system.

(Original) 37. An apparatus for detecting molecular signals from a sample, wherein the sample acts as a signal source, the apparatus comprising:

an electromagnetic emissions detector positioned near to the sample for detecting an emissions signal from the signal source;

a Super Conducting Quantum Interference Device (SQUID) electrically connected to the electromagnetic emissions detector, wherein the Super Conducting Quantum Interference Device is cryogenically cooled;

a noise canceling component;

a noise generator for providing structured or uniform noise to the emissions signals from the signal source, and for providing an inverted version of the noise to the noise canceling component;

electromagnetic shielding configured to shield the signal source, electromagnetic emissions detector, and Super Conducting Quantum Interference Device from external electromagnetic radiation;

a controller for controlling the Super Conducting Quantum Interference Device; and

an output port for outputting an amplified emissions signal, wherein the amplified emissions signal represents amplification of the signal source signal, through stochastic resonance, by the noise.

(Original) 38. The apparatus of claim 37 wherein the noise canceling component is .positioned between the electromagnetic emissions detector and an input to the SQUID.

(Original) 39. The apparatus of claim 37 wherein the noise canceling component is .positioned between the electromagnetic emissions detector and an output to the SQUID.

(Original) 40. The apparatus of claim 37 wherein the noise generator includes first and second noise generating components, and noise canceling component includes first and second noise canceling components, the wherein the first noise canceling component is positioned between the electromagnetic emissions detector and an input to the SQUID and is coupled to the first noise generator, and wherein the second noise canceling component is positioned at an output of the SQUID and is coupled to the second noise generator.

(Original) 41. The apparatus of claim 37 wherein the noise generator provides a series of random values from a random number generator, and wherein the noise canceling component subtracts the series of random values from the amplified emissions signal.